I. PATENT ABSTRACTS OF JAPAN

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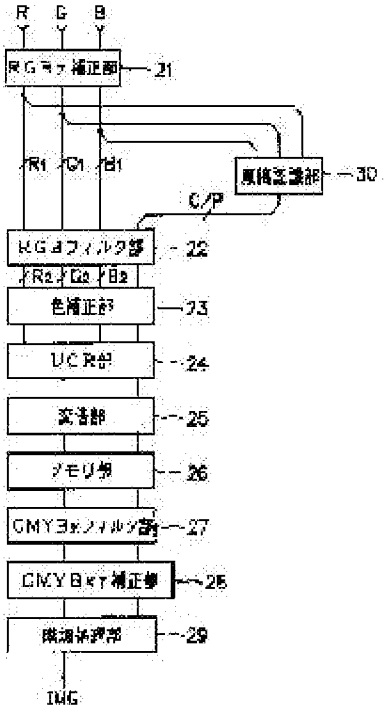
(54) IMAGE PROCESSOR



(57)Abstract:
PROBLEM TO BE SOLVED: To provide an image processor which can correct the tilt of a partial image data.
SOLUTION: An image processing part corrects the rotation of the image data and consists of an RGB filter part 22 which performs the smoothing or sharpening processing, a color correction part 23 which converts the RGB data into the CMY data, a VCR part 24 which performs the addition/deletion of colors at a CMY common part and generates the Bk data, a memory part 26 which serves as a correction work area, a CMBYkγ correction part 28 which changes a γ curve, etc. In such a constitution, the part 26 extracts the contour of the read image data within a designated coordinate to trace the contour, calculates the coordinate serving as a reference line from the coordinate point after tracing of the contour, and calculates the tilt (angle) from the calculated coordinate. The contour extraction result is stored in a memory. Thus it is possible to detect the tilt based on the image data included in a designated area and also to correct the detected tilt.

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NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]An image processing device comprising:
An image input means which acquires a picture of a manuscript as image data.
A contour extracting means which extracts an outline of a picture from said image data.
A contour tracking means to pursue an outline of said picture.
A ****** means to detect inclination based on a result of having pursued said outline.

[Claim 2]The image processing device according to claim 1 performing detection of said inclination by pursuing said extracted outline.
[Claim 3]The image processing device according to claim 1 or 2 detecting said inclination based on image data of specific coordinate areas which said ****** means was provided with a territorial extension means to specify specific coordinate areas to said picture further, and were specified by this territorial extension means.
[Claim 4]An image processing device given in any 1 paragraph of claims 1-3, wherein said ****** means detects quantity of inclination in biaxial [of a determined direction] and calculates a coordinate value of a large value of the (maximum-minimum) of x shaft orientations, and the (maximum-minimum) of y shaft orientations.
[Claim 5]An image processing device given in any 1 paragraph of claims 1-4, wherein said ****** means is provided with an image rotation means to rotate image data of said specified coordinate areas further.
[Claim 6]An image processing device given in any 1 paragraph of claims 1-5 displaying image data which said image processing device was further provided with an image display means, and was acquired by said image input means.
[Claim 7]The image processing device according to claim 5 or 6, wherein a rotary place of image data based on said image rotation means is a longitudinal direction of x shaft orientations of said territorial extension means, and the y shaft orientations.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]Especially this invention relates to the image processing device which has a function which detects inclination of inputted image data about an image processing device.

[0002]
[Description of the Prior Art]Conventionally, a horizontal component and a vertical component exist in what constitutes pictures, for example, a table, a pillar, the sea, etc., such as a photograph, so that it may certainly say. In these image data, the input manuscript may be declining or scenery etc. may lean. In such a case, the demand of the spin compensation of the minute angle of a picture arises, and these many are amendments in level and a perpendicular direction.
[0003]Some image processing devices have some which have a function in which inclination of a manuscript is detected, it can rotate (manuscript size detection) or image data can be rotated with an operator's directions. For example, it is amending after the outline extraction which specifies and amends two line segments to a display image and which takes and amends distribution to a ruled line, and manuscript size detection etc.
[0004]
[Problem(s) to be Solved by the Invention]However, the above-mentioned conventional example is amendment to overall inclination of a manuscript picture, and does not carry out inclination correction to the partial picture over image data, such as a background image.
[0005]An object of this invention is to provide the image processing device which makes possible inclination correction to partial image data.
[0006]
[Means for Solving the Problem]This invention is characterized by an image processing device comprising the following, in order to attain this purpose.
An image input means which acquires a picture of a manuscript as image data.
A contour extracting means which extracts an outline of a picture from image data.
A contour tracking means to pursue an outline of a picture.
A ****** means to detect inclination based on a result of having pursued an outline.

[0007]Detection of inclination of the above is performed by pursuing an extracted outline, and a ****** means is still better to detect inclination based on image data of specific coordinate areas which were provided with a territorial extension means to specify specific coordinate areas to a picture, and were specified by this territorial extension means.
[0008]A ****** means is good to detect quantity of inclination in biaxial [of a determined direction], and for the (maximum-minimum) of x shaft orientations and y shaft orientations (maximum-minimum) to calculate a coordinate value of a large value.
[0009]A ****** means is provided with an image rotation means to rotate image data of specified coordinate areas, and an image processing device is good to display image data which provided with and acquired an image display means.
[0010]A rotary place of image data based on an image rotation means is good to consider it as x shaft orientations of a territorial extension means, and a longitudinal direction of the y shaft orientations.
[0011]
[Embodiment of the Invention]Next, with reference to an accompanying drawing, the embodiment of the image processing device by this invention is described in detail. Reference of drawing 1 - drawing 8 shows one embodiment of the image processing device of this invention.
[0012]Drawing 1 is a block diagram showing the main composition of the digital copier concerning this invention. The image processing device of this embodiment, By the image reading part 11 read as digital image data while scanning a manuscript, the image processing

portion 12 which performs color correction and modification (rotation) to the image data from an image reading part, and image processing. It consists of the image recording section 13 which carries out the output process of the processed image data to a recording form, the picture display part 14 which displays image data, and the coordinates designation part 15 which specifies coordinates.

[0013]Drawing 2 is a block diagram showing the more detailed composition of the image processing portion 12 shown in drawing 1. The image processing portion 12 performs the following functions by pipeline processing. The RGB gamma correction part 21 amends gamma of a picture based on the look-up table set up beforehand. The manuscript recognition part 30 judges a character area or a pattern area according to RGB image data, and outputs a C/P signal to the RGB-filters part 22. Cascade connection of this output signal C/P is carried out to the RGB-filters part 22, the color correction part 23, VCR part 24, the variable power parts 25, the memory part 26, the CMYBk filter part 27, the CMYBk gamma correction part 28, and the gradation processing section 29, and it outputs IMG synchronizing with image data. Each block is performed by changing processing of a character, and processing of a pattern by output signal C/P.

[0014]The RGB-filters part 22 performs data smoothing and sharp-ized processing with the spatial filter of NxN with the performance of image data. The color correction part 23 changes R-G-B data into C-M-Y data with primary masking etc. VCR part 24 is expressed by four colors of C-M-Y-Bk in order to raise the color reproduction of image data. VCR (color addition removal) of the intersection of C-M-Y is performed, and Bk data is generated. the plane sequence to which the output IMG outputs Isshiki among C-M-Y-Bk -- it is next Isshiki. That is, full color (four colors) data is created by reading a manuscript 4 times.

[0015]Horizontal-scanning variable power performs expansion and reduction of a scanning direction, or actual size processing. The memory part 26 is provided with a page memory, and performs picture deformation and rotation. The CMYBk filter part 27 performs data smoothing and sharp-ized processing using the spatial filter of NxN according to the frequency characteristic of the image recording section 13, and an image state. The CMYBk gamma correction part 28 processes by changing gamma curve according to the frequency characteristic and image state of the image recording section 13.

[0016]The gradation processing section 29 quantizes dithering etc. according to the gradation characteristic of the image recording section 13.

[0017]The memory part 26 which is a feature section of this embodiment is explained. Drawing 3 shows the example of composition of the memory part 26, and drawing 4 is a flow chart which shows an example of operation. Generally, two coordinates of the reference region which amends inclination of a manuscript are specified. This specification is performed by inputting coordinates from the scanning section of an image processing device (Step S10). Image data is read at Step S11. For example, the horizon manuscript of drawing 8 is read and it writes in the 1st memory 31.

[0018]The outline within the specification coordinates of the first memory 31 is extracted, and contour tracking is performed. The coordinates of the line which serves as a standard from a coordinate point after pursuit of an outline are computed. Inclination (angle) is computed from these coordinates (S12). The extraction result of an outline is stored in the 2nd memory 32.

[0019]From this computed angle, image data is rotated and amended so that it may become horizontally vertical (S13). The following formula may perform this rotation simply and other methods may be used.

[0020]
[Equation 1]

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} x' \\ y' \end{bmatrix}$$

[0021]Thus, the result after rotation is memorized in the 3rd memory 33, and image data is outputted (S14). Here, in order to explain easily, it divided with the 1st memory 31, the 2nd memory 32, and the 3rd memory 33, and explained, but it is not limited to this.
[0022]Below, calculation of the correction direction of inclination correction is explained. As shown in drawing 8, the value which specified the point A and the point B determines. When it is considered as the point A (Ax, Ay) and the point B (Bx, By), a reference axis is decided in the following procedures.
[0023]** An operator performs specification [which / of a x axis and the y-axis] at the times other than y shaft-basis **;** and ** at the time of x shaft-basis **;|(Ax-Bx)/(Ay-By)|>=0.5 at the time of;|(Ax-Bx)/(Ay-By)|>=2.
[0024]That is, it judges by a ratio of the length of x of a value which carried out the coordinate input, and y. An ingredient which this wants to make horizontal and vertical generally is from the feature that it is long. x and the direction of y shaft basis may be inputted if needed. Thus, detection of a characteristic line which an operator wants to extract is made easy by specifying two vertical angles. It cannot be overemphasized that processing time becomes short by overall treatment which specifies a range.
[0025]Next, detection of inclination is explained in detail using a flow chart of drawing 5. Outline extraction of Step S20 binary-izes inputted image data with a certain threshold (concentration 0.2-0.3), and carries out outline extraction. Generally this procedure is shown by following formula. A following formula is based on a matrix table which made a central pixel e of 3x3 of drawing 6.
[0026]
[External Character 1]

(a AND b AND c AND d AND e AND f AND g AND h AND i) AND e

[0027]Let contour tracking of Step S21 be the following a-e procedure which makes the starting point the point within the points A and B of drawing 8, for example.
a) When the point A is left and there is no data in 1-8 of drawing 7, move the point P of a central pixel to the coordinates of 5.
b) And repeat the above-mentioned a until the coordinates of 1-8 have contour data.
c) If it is the coordinates outside the field of the points A and B, it will end without amendment data.
d) When coordinates are one of the coordinates of 1-8, consider it as contour data. And it moves in the further following direction and repeat execution of the following processing is carried out. When data is in the point which does not have contour data in the order of 2, 3, 4, --8 when data is in 1 move 2, When data is in the point which does not have contour data in the order of 3, 4, 5, --8, and 1 move 3, When data is in the point which does not have contour data in the order of 4, 5, 6, --8, and 1 and 2 move 4, When data is in the point which does not have contour data in the order of 5, 6, --8, 1, --3 move 5, When data is in the point which does not have contour data in the order of 6, 7, 8, 1, --4 move 6, When data is in the point which does not have contour data in the order of 7, 8, 1, --5 move 7, Outline extraction will be ended, if it is the data detected in the direction same in the coordinates or the past outside the field of the move e points A and B as the point which does

not have contour data in the order of 1, 2, --7 when data is in the point which does not have contour data in the order of 8, 1, 2, --6 move 8.
[0028]min of Step S22 and max value calculation compute an angle in a group of coordinates of the larger one of a difference of a maximum of x coordinates of a contour coordinate, and a minimum of x coordinates, and a difference of a maximum of y coordinates and a minimum of y coordinates. That is, this angle is amended so that it may become 0 degree, 270 degrees, 90 degrees, and 180 degrees.
[0029]As modification of this embodiment, it is applicable also to an image device provided with an indicator. By having an indicator, execution of amendment becomes certain by displaying the contents of the 1st memory, the 2nd memory, and the 3rd memory which were explained by drawing 3, and inputting after displaying the 2nd memory of a coordinate input.
[0030]If there is an indicator, it will become possible for the points A and B not to compute a field but to compute an angle of a line segment for two points of the points A and B. When taking a method of computing an angle at the points A and B, it is possible to specify the points A and B from the 1st memory, and a contour extraction process is not needed, but it may be more intelligible for the feature to see contour data of the 2nd memory and to specify the points A and B. By displaying the 3rd memory, a result can be seen and it becomes easy [a check or change]. Also when rotating, combination of inclination correction plus rotation is also easy. What kind of means may be used for outline extraction and contour tracking of this embodiment.
[0031]According to the above-mentioned embodiment, inclination of image data is detectable by carrying out contour tracking of the result with outline extraction of image data. When detecting inclination of image data, a detection area can be specified, data in a detection area can detect inclination, and an aspect ratio of a detection area can extract horizontally or vertically (rotation).
[0032]When detecting inclination of image data, outline extraction of image data can be performed, the result can be displayed, a detection area can be specified, data in a detection area can detect inclination, and an aspect ratio of a detection area can amend horizontally or vertically (rotation).
[0033]When detecting inclination of image data, outline extraction of image data can be performed, the result can be displayed, and an aspect ratio of a line segment which specified and specified a line segment of inclination can amend horizontally or vertically (rotation).
[0034]
[Effect of the Invention]Like [explanation / above / it is ****** and], the image processing device of this invention extracts the outline of a picture from the acquired image data, and detects inclination based on the result of having pursued and pursued the outline of the picture. By detection of this inclination, facilitating of the inclination correction by displaying amendment (rotation), the detection of inclination based on the image data of the appointed field, and outline extraction of image data horizontally or vertically, etc. become possible.

TECHNICAL FIELD

[Field of the Invention]Especially this invention relates to the image processing device which has a function which detects inclination of inputted image data about an image processing device.

PRIOR ART

[Description of the Prior Art]Conventionally, a horizontal component and a vertical component exist in what constitutes pictures, for example, a table, a pillar, the sea, etc., such as a photograph, so that it may certainly say. In these image data, the input manuscript may be declining or scenery etc. may lean. In such a case, the demand of the spin compensation of the minute angle of a picture arises, and these many are amendments in level and a perpendicular direction.
[0003]Some image processing devices have some which have a function in which inclination of a manuscript is detected, it can rotate (manuscript size detection) or image data can be rotated with an operator's directions. For example, it is amending after the outline extraction which specifies and amends two line segments to a display image and which takes and amends distribution to a ruled line, and manuscript size detection etc.

EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, the above-mentioned conventional example is amendment to overall inclination of a manuscript picture, and does not carry out inclination correction to the partial picture over image data, such as a background image.
[0005]An object of this invention is to provide the image processing device which makes possible inclination correction to partial image data.

MEANS

[Means for Solving the Problem]This invention is characterized by an image processing device comprising the following, in order to attain this purpose.
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[0012]Drawing 1 is a block diagram showing the main composition of the digital copier concerning this invention. The image processing device of this embodiment, By the image reading part 11 read as digital image data while scanning a manuscript, the image processing portion 12 which performs color correction and modification (rotation) to the image data from an image reading part, and image processing. It consists of the image recording section 13 which carries out the output process of the processed image data to a recording form, the picture display part 14 which displays image data, and the coordinates designation part 15 which specifies coordinates.
[0013]Drawing 2 is a block diagram showing the more detailed composition of the image processing portion 12 shown in drawing 1. The image processing portion 12 performs the following functions by pipeline processing. The RGB gamma correction part 21 amends gamma of a picture based on the look-up table set up beforehand. The manuscript recognition part 30 judges a character area or a pattern area according to RGB image data, and outputs a C/P signal to the RGB-filters part 22. Cascade connection of this output signal C/P is carried out to the RGB-filters part 22, the color correction part 23, VCR part 24, the variable power parts 25, the memory part 26, the CMYBk filter part 27, the CMYBk gamma correction part 28, and the gradation processing section 29, and it outputs IMG synchronizing with image data. Each block is performed by changing processing of a character, and processing of a pattern by output signal C/P.
[0014]The RGB-filters part 22 performs data smoothing and sharp-ized processing with the spatial filter of NxN with the performance of image data. The color correction part 23 changes R-G-B data into C-M-Y data with primary masking etc. VCR part 24 is expressed by four colors of C-M-Y-Bk in order to raise the color reproduction of image data. VCR (color addition removal) of the intersection of C-M-Y is performed, and Bk data is generated. the plane sequence to which the output IMG outputs Isshiki among C-M-Y-Bk -- it is next Isshiki. That is, full color (four colors) data is created by reading a manuscript 4 times.
[0015]Horizontal-scanning variable power performs expansion and reduction of a scanning direction, or actual size processing. The memory part 26 is provided with a page memory, and performs picture deformation and rotation. The CMYBk filter part 27 performs data smoothing and sharp-ized processing using the spatial filter of NxN according to the frequency characteristic of the image recording section 13, and an image state. The CMYBk gamma correction part 28 processes by changing gamma curve according to the frequency characteristic and image state of the image recording section 13.
[0016]The gradation processing section 29 quantizes dithering etc. according to the gradation characteristic of the image recording section 13.
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[0019]From this computed angle, image data is rotated and amended so that it may become horizontally vertical (S13). The following formula may perform this rotation simply and other methods may be used.

[0020]

[Equation 1]

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} x' \\ y' \end{bmatrix}$$

[0021]Thus, the result after rotation is memorized in the 3rd memory 33, and image data is outputted (S14). Here, in order to explain easily, it divided with the 1st memory 31, the 2nd memory 32, and the 3rd memory 33, and explained, but it is not limited to this.

[0022]Below, calculation of the correction direction of inclination correction is explained. As shown in drawing 8, the value which specified the point A and the point B determines. When it is considered as the point A (Ax, Ay) and the point B (Bx, By), a reference axis is decided in the following procedures.

[0023]** An operator performs specification [which / of a x axis and the y-axis] at the times other than y shaft-basis **;** and ** at the time of x shaft-basis **;|(Ax-Bx)/(Ay-By)|>=0.5 at the time of;|(Ax-Bx)/(Ay-By)|>=2.

[0024]That is, it judges by a ratio of the length of x of a value which carried out the coordinate input, and y. An ingredient which this wants to make horizontal and vertical generally is from the feature that it is long. x and the direction of y shaft basis may be inputted if needed. Thus, detection of a characteristic line which an operator wants to extract is made easy by specifying two vertical angles. It cannot be overemphasized that processing time becomes short by overall treatment which specifies a range.

[0025]Next, detection of inclination is explained in detail using a flow chart of drawing 5. Outline extraction of Step S20 binary-izes inputted image data with a certain threshold (concentration 0.2-0.3), and carries out outline extraction. Generally this procedure is shown by following formula. A following formula is based on a matrix table which made a central pixel e of 3x3 of drawing 6.

[0026]

[External Character 1]

(a AND b AND c AND d AND e AND f AND g AND h AND i) AND e

[0027]Let contour tracking of Step S21 be the following a-e procedure which makes the starting point the point within the points A and B of drawing 8, for example.

a) When the point A is left and there is no data in 1-8 of drawing 7, move the point P of a central pixel to the coordinates of 5.

b) And repeat the above-mentioned a until the coordinates of 1-8 have contour data.

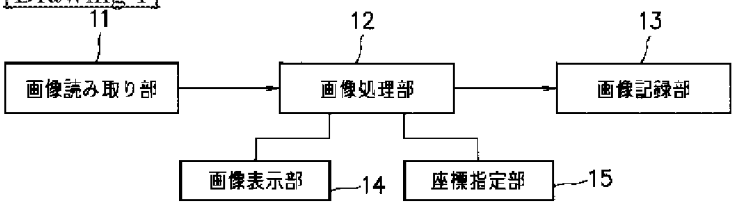
c) If it is the coordinates outside the field of the points A and B, it will end without amendment data.
d) When coordinates are one of the coordinates of 1-8, consider it as contour data. And it moves in the further following direction and repeat execution of the following processing is carried out. When data is in the point which does not have contour data in the order of 2, 3, 4, --8 when data is in 1 move 2, When data is in the point which does not have contour data in the order of 3, 4, 5, --8, and 1 move 3, When data is in the point which does not have contour data in the order of 4, 5, 6, --8, and 1 and 2 move 4, When data is in the point which does not have contour data in the order of 5, 6, --8, 1, --3 move 5, When data is in the point which does not have contour data in the order of 6, 7, 8, 1, --4 move 6, When data is in the point which does not have contour data in the order of 7, 8, 1, --5 move 7, Outline extraction will be ended, if it is the data detected in the direction same in the coordinates or the past outside the field of the move e points A and B as the point which does not have contour data in the order of 1, 2, --7 when data is in the point which does not have contour data in the order of 8, 1, 2, --6 move 8.
[0028]min of Step S22 and max value calculation compute an angle in a group of coordinates of the larger one of a difference of a maximum of x coordinates of a contour coordinate, and a minimum of x coordinates, and a difference of a maximum of y coordinates and a minimum of y coordinates. That is, this angle is amended so that it may become 0 degree, 270 degrees, 90 degrees, and 180 degrees.
[0029]As modification of this embodiment, it is applicable also to an image device provided with an indicator. By having an indicator, execution of amendment becomes certain by displaying the contents of the 1st memory, the 2nd memory, and the 3rd memory which were explained by drawing 3, and inputting after displaying the 2nd memory of a coordinate input.
[0030]If there is an indicator, it will become possible for the points A and B not to compute a field but to compute an angle of a line segment for two points of the points A and B. When taking a method of computing an angle at the points A and B, it is possible to specify the points A and B from the 1st memory, and a contour extraction process is not needed, but it may be more intelligible for the feature to see contour data of the 2nd memory and to specify the points A and B. By displaying the 3rd memory, a result can be seen and it becomes easy [a check or change]. Also when rotating, combination of inclination correction plus rotation is also easy. What kind of means may be used for outline extraction and contour tracking of this embodiment.
[0031]According to the above-mentioned embodiment, inclination of image data is detectable by carrying out contour tracking of the result with outline extraction of image data. When detecting inclination of image data, a detection area can be specified, data in a detection area can detect inclination, and an aspect ratio of a detection area can extract horizontally or vertically (rotation).
[0032]When detecting inclination of image data, outline extraction of image data can be performed, the result can be displayed, a detection area can be specified, data in a detection area can detect inclination, and an aspect ratio of a detection area can amend horizontally or vertically (rotation).
[0033]When detecting inclination of image data, outline extraction of image data can be performed, the result can be displayed, and an aspect ratio of a line segment which specified and specified a line segment of inclination can amend horizontally or vertically (rotation).

DESCRIPTION OF DRAWINGS

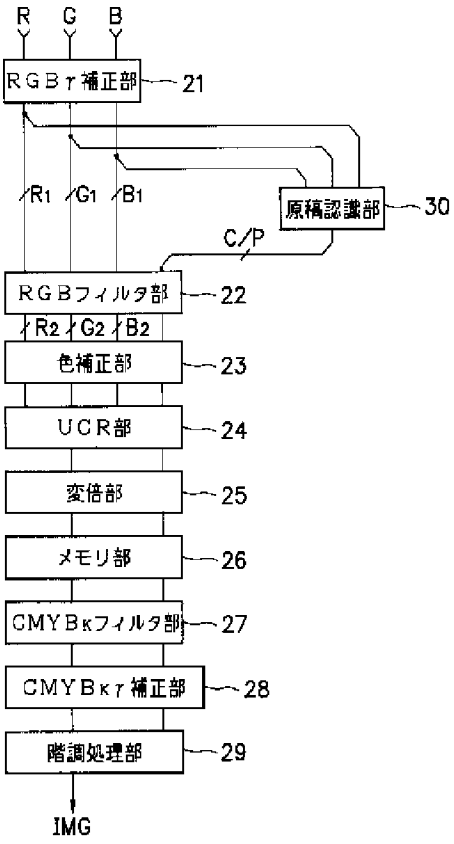
[Brief Description of the Drawings]
[Drawing 1]It is a main configuration block figure showing the embodiment of the image processing device of this invention.
[Drawing 2]It is a block diagram showing the example of composition of the image processing portion of drawing 1.
[Drawing 3]It is a block diagram showing the example of composition of the memory part of drawing 2.
[Drawing 4]It is a flow chart which shows the example of reference-axis setting out of operation.
[Drawing 5]It is a flow chart which shows the example of detected inclination of operation.
[Drawing 6]It is a matrix for explaining the procedure of outline extraction.
[Drawing 7]It is a matrix for explaining the detection procedure of inclination.
[Drawing 8]It is an example of a manuscript picture for explaining the procedure of amendment.
[Description of Notations]
11 Manuscript reading part
12 Image processing portion
13 Image recording section
14 Picture display part
15 Coordinates designation part
21 RGB gamma correction part
22 RGB-filters part
23 Color correction part
24 VCR part
25 Variable power parts
26 Memory part
27 CMYBk filter part
28 CMYBk gamma correction part
29 Gradation processing section
30 Manuscript recognition part
31 The 1st memory
32 The 2nd memory
33 The 3rd memory

DRAWINGS

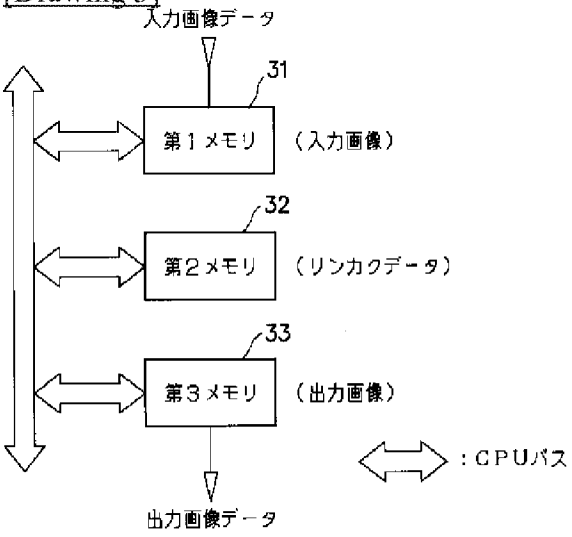
[Drawing 1]



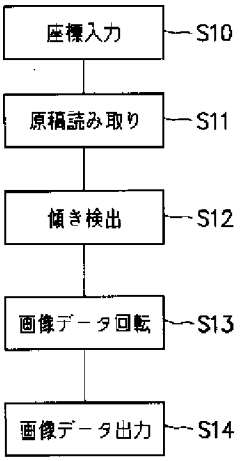
[Drawing 2]



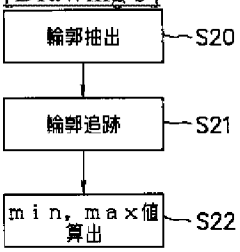
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Drawing 6]

a	b	c
d	e	f
g	h	i

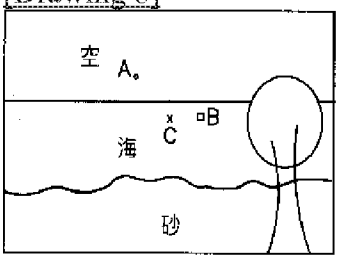
eは中心画素

[Drawing 7]

8	1	2
7	P	3
6	5	4

Pは中心画素

[Drawing 8]



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[0005]This invention does not come out to a manuscript and an object of this invention is to provide the image processing device which makes possible inclination correction to the image data in a manuscript.

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Attorney(s): --

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1. Title of the Invention

IMAGE PROCESSING APPARATUS

2. Claims

(omitted)

3. Detailed Description of the Invention (Selected Portions)

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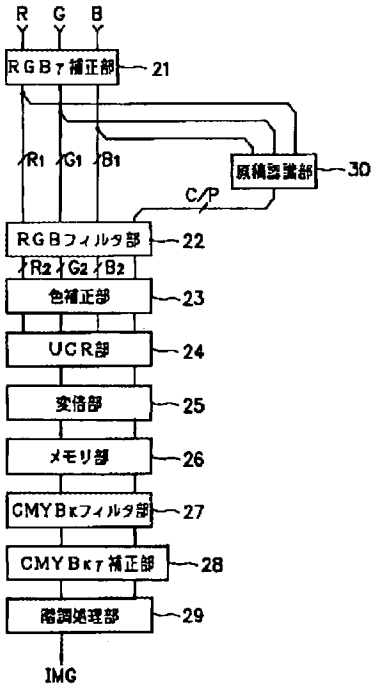
(54)【発明の名称】　画像処理装置

(57)【要約】

【課題】　部分的な画像データに対する傾き補正を可能とする画像処理装置を得る。

【解決手段】　画像データの回転補正を実行する画像処理部１２は、平滑化処理や鮮鋭化処理を行うＲＧＢフィルタ部２２、Ｒ・Ｇ・Ｂデータを Ｃ・Ｍ・Ｙデータに変換する色補正部２３、Ｃ・Ｍ・Ｙの共通部分の加色除去を行ないＢｋデータを生成するＶＣＲ部２４、補正のワークエリアとなるメモリ部２６、γカーブの変更処理を行うＣＭＹＢｋγ補正部２８等により構成される。この構成において、メモリ部２６では、読取り画像データの指定座標内の輪郭を抽出して輪郭追跡を行ない、輪郭の追跡後に座標点から基準となる線の座標を算出し、この座標から傾き（角度）を算出する。輪郭の抽出結果はメモリ内に格納される。これにより、指定領域の画像データに基づく傾きの検出および傾き補正が可能となる。



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【特許請求の範囲】

【請求項1】　原稿の画像を画像データとして取得する画像入力手段と、

前記画像データから画像の輪郭を抽出する輪郭抽出手段と、

前記画像の輪郭を追跡する輪郭追跡手段と、

前記輪郭を追跡した結果に基づき傾きを検出する傾検出手段とを備えたことを特徴とする画像処理装置。

【請求項2】　前記傾きの検出は前記抽出された輪郭を追跡することにより行うことを特徴とする請求項1記載の画像処理装置。

【請求項3】　前記傾検出手段は、さらに前記画像に対して特定の座標領域を指定する領域指定手段を備え、該領域指定手段により指定された特定の座標領域の画像データに基づき前記傾きを検出することを特徴とする請求項1または2記載の画像処理装置。

【請求項4】　前記傾検出手段は、傾きの量を所定方向の2軸において検出し、x軸方向の（最大値－最小値）とy軸方向の（最大値－最小値）の大きい値の、座標値を求めることを特徴とする請求項1から3の何れか1項に記載の画像処理装置。

【請求項5】　前記傾検出手段は、さらに前記指定した座標領域の画像データを回転させる画像回転手段を備えることを特徴とする請求項1から4の何れか1項に記載の画像処理装置。

【請求項6】　前記画像処理装置は、さらに画像表示手段を備え、前記画像入力手段により取得した画像データを表示させることを特徴とする請求項1から5の何れか1項に記載の画像処理装置。

【請求項7】　前記画像回転手段による画像データの回転位置は、前記領域指定手段のx軸方向とy軸方向のうちの長手方向であることを特徴とする請求項5または6記載の画像処理装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、画像処理装置に関し、特に、入力画像データの傾きを検知する機能を有する画像処理装置に関する。

【0002】

【従来の技術】従来、写真等の画像、例えばテーブル・柱・海等を構成するものには、必ずといっていいほど水平成分および垂直成分が存在する。これらの画像データにおいて、入力原稿が傾いていたり、風景などが傾いている場合がある。このような場合には、画像の微小角度の回転補正の要求が生じ、これらの多くは水平、垂直方向における補正である。

【0003】画像処理装置の一部には、原稿の傾きを検知して（原稿サイズ検知）回転したり、操作者の指示により画像データを回転したりできる機能を有するものがある。例えば、表示画像に対して線分2点を指定して補正する、ケイ線に対して分布をとり補正する、輪郭抽出および原稿サイズ検知後に補正する等である。

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【0004】

【発明が解決しようとする課題】しかしながら、上記の従来例は原稿画像の全体的な傾きに対する補正であり、背景画像等の画像データに対する部分的な画像に対する傾き補正をするものではない。

【0005】本発明は、部分的な画像データに対する傾き補正を可能とする画像処理装置を提供することを目的とする。

【0006】

【課題を解決するための手段】かかる目的を達成するため、本発明の画像処理装置は、原稿の画像を画像データとして取得する画像入力手段と、画像データから画像の輪郭を抽出する輪郭抽出手段と、画像の輪郭を追跡する輪郭追跡手段と、輪郭を追跡した結果に基づき傾きを検出する傾検出手段とを備えたことを特徴としている。

【0007】また、上記の傾きの検出は抽出された輪郭を追跡することにより行い、さらに、傾検出手段は、画像に対して特定の座標領域を指定する領域指定手段を備え、この領域指定手段により指定された特定の座標領域の画像データに基づき傾きを検出するとよい。

【0008】また、傾検出手段は、傾きの量を所定方向の2軸において検出し、x軸方向の（最大値－最小値）とy軸方向の（最大値－最小値）とが大きい値の、座標値を求めるとよい。

【0009】さらに、傾検出手段は、指定した座標領域の画像データを回転させる画像回転手段を備え、画像処理装置は、画像表示手段を備え、取得した画像データを表示させるとよい。

【0010】なお、画像回転手段による画像データの回転位置は、領域指定手段のx軸方向とy軸方向のうちの長手方向とするとよい。

【0011】

【発明の実施の形態】次に添付図面を参照して本発明による画像処理装置の実施の形態を詳細に説明する。図1～図8を参照すると本発明の画像処理装置の一実施形態が示されている。

【0012】図1は、本発明に係るデジタル複写機の主要構成を示すブロック図である。本実施形態の画像処理装置は、原稿を走査しながらデジタル画像データとして読み取る画像読取部11、画像読取部からの画像データに対して色修正や変形（回転）を実行する画像処理部12、画像処理により処理された画像データを記録紙に出力処理する画像記録部13、画像データを表示する画像表示部14、座標を指定する座標指定部15とからなる。

【0013】図2は、図1に示した画像処理部12のより詳細な構成を示すブロック図である。画像処理部12は以下の機能をパイプライン処理で行う。RGBγ補正

部２１は、予め設定された、ルックアップテーブルに基づいて画像のγを補正する。原稿認識部３０は、ＲＧＢ画像データに応じて文字領域か絵柄領域かを判定して、ＲＧＢフィルタ部２２にＣ／Ｐ信号を出力する。この出力信号Ｃ／Ｐは、ＲＧＢフィルタ部２２、色補正部２３、ＶＣＲ部２４、変倍部２５、メモリ部２６、ＣＭＹＢｋフィルタ部２７、ＣＭＹＢｋγ補正部２８、階調処理部２９にカスケード接続され、画像データに同期してＩＭＧを出力する。各ブロックは、出力信号Ｃ／Ｐにより、文字の処理と絵柄の処理とを切りかえて行なう。

【００１４】ＲＧＢフィルタ部２２は、画像データの性能により、Ｎ×Ｎの空間フィルタで平滑化処理や鮮鋭化処理を行なう。色補正部２３は、Ｒ・Ｇ・Ｂデータを一次のマスキングなどでＣ・Ｍ・Ｙデータに変換する。ＶＣＲ部２４は、画像データの色再現を向上させるため、Ｃ・Ｍ・Ｙ・Ｂｋの４色で表現する。Ｃ・Ｍ・Ｙの共通部分のＶＣＲ（加色除去）を行ない、Ｂｋデータを生成する。また、出力ＩＭＧは、Ｃ・Ｍ・Ｙ・Ｂｋのうち一色を出力する面順次の一色である。つまり、４回原稿の読み取りを行なうことにより、フルカラー（４色）データを作成する。

【００１５】主走査変倍は、主走査方向の拡大・縮少、あるいは等倍処理を実行する。メモリ部２６は、ページメモリを備えて、画像変形や回転を行う。ＣＭＹＢｋフィルタ部２７は、画像記録部１３の周波数特性や、画像状態に応じてＮ×Ｎの空間フィルタを用い、平滑化処理や鮮鋭化処理を行なう。ＣＭＹＢｋγ補正部２８は、画像記録部１３の周波数特性や画像状態に応じて、γカーブを変更し処理を行う。

【００１６】階調処理部２９は、画像記録部１３の階調特性に応じてディザ処理等の量子化を行なう。

【００１７】さらに、本実施形態の特徴部であるメモリ部２６について説明する。図３はメモリ部２６の構成例を示し、図４は動作例を示すフローチャートである。一般には、原稿の傾きを補正する基準領域の座標２点を指定する。この指定は、画像処理装置の走査部から座標を入力して行う（ステップＳ１０）。ステップＳ１１で画像データを読み取る。例えば、図８の水平線原稿を読み取り、第１メモリ３１に書き込む。

【００１８】第一メモリ３１の指定座標内の輪郭を抽出して輪郭追跡を行なう。輪郭の追跡後に座標点から基準となる線の座標を算出する。この座標から傾き（角度）＊を算出する（Ｓ１２）。輪郭の抽出結果は、第２メモリ３２に格納される。

【００１９】この算出した角度から、水平垂直になるように画像データを回転して補正する（Ｓ１３）。この回転は、単純に下記の式により行っても良いし、他の方式を用いても良い。

【００２０】

【数１】

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} x' \\ y' \end{bmatrix}$$

【００２１】このように、回転後の結果を第３メモリ３３に記憶し、画像データを出力する（Ｓ１４）。ここでは、説明を容易にするために、第１メモリ３１、第２メモリ３２、第３メモリ３３と分けて説明したが、これに限定されるものではない。

【００２２】つぎに、傾き補正の補正方向の算出について説明する。図８に示すように、点Ａ、点Ｂを指定した値により決定する。点Ａ（Ａｘ、Ａｙ）、点Ｂ（Ｂｘ、Ｂｙ）とした時、基準軸を以下の手順で決める。

【００２３】①；｜（Ａｘ－Ｂｘ）／（Ａｙ－Ｂｙ）｜≧２の時、ｘ軸基準

②；｜（Ａｘ－Ｂｘ）／（Ａｙ－Ｂｙ）｜≧０．５の時、ｙ軸基準

③；①、②　以外の時は、ｘ軸、ｙ軸の何れかの指定を操作者が行なう。

【００２４】つまり、座標入力した値の、ｘ、ｙの長さの比により判定する。これは、一般に、水平・垂直にしたい成分は長いという特徴からである。また、必要に応じて、ｘ、ｙ軸基準方向を入力してもよい。このように、対角２点を指定することにより、操作者の抽出したい特徴ある線の検出を容易とする。また、範囲を指定する全面処理により、処理時間が短くなるのは言うまでもない。

【００２５】次に、傾きの検出について、図５のフローチャートを用いて詳細に説明する。ステップＳ２０の輪郭抽出は、入力画像データをある閾値で２値化（濃度０．２～０．３）して輪郭抽出をする。この手順は一般に次式で示される。次式は、図６の３×３のｅを中心画素としたマトリックス表に基づいている。

【００２６】

【外１】

$$(a \text{ AND } b \text{ AND } c \text{ AND } d \text{ AND } e \text{ AND } f \text{ AND } g \text{ AND } h \text{ AND } i) \text{ AND } e$$

【００２７】ステップＳ２１の輪郭追跡は、例えば図８の点Ａ、Ｂ内の点を始点とする下記のａ～ｅ手順とする。

ａ）点Ａから出発し、図７の１～８にデータがない時は、中心画素の点Ｐを５の座標に移動する。

ｂ）そして、１～８の座標に輪郭データがあるまで上記ａを繰り返す。

ｃ）点Ａ、Ｂの領域外の座標ならば、補正データなしで終了する。

ｄ）１～８の座標に座標があるときは、輪郭データとする。そして、さらに下記の方向へ移動し、下記の処理を繰り返し実行する。

1にデータのある時は、2、3、4、…8の順で輪郭データのない点に移動
2にデータのある時は、3、4、5、…8、1の順で輪郭データのない点に移動
3にデータのある時は、4、5、6、…8、1、2の順で輪郭データのない点に移動
4にデータのある時は、5、6、…8、1、…3の順で輪郭データのない点に移動
5にデータのある時は、6、7、8、1、…4の順で輪郭データのない点に移動
6にデータのある時は、7、8、1、…5の順で輪郭データのない点に移動
7にデータのある時は、8、1、2、…6の順で輪郭データのない点に移動
8にデータのある時は、1、2、…7の順で輪郭データのない点に移動

e）点A、Bの領域外の座標又は過去に同じ方向で検出したデータならば、輪郭抽出を終了する。

【0028】ステップS22のmin、max値算出は、輪郭座標の最大x座標と最小x座標との差、および最大y座標と最小y座標との差の、大きい方の座標の組で角度を算出する。つまり、この角度を0°、270°、90°、180°になるように補正する。

【0029】本実施形態の変形としては、表示部を備えた画像装置にも適用可能である。表示部を備えることにより、図3で説明した第1メモリ、第2メモリ、第3メモリの内容を表示させ、座標入力の第2メモリを表示後入力することにより、補正の実行が確実となる。

【0030】さらに、表示部があれば、点A、Bは領域を算出するのではなく、点A、Bの2点間の線分の角度を算出することが可能となる。点A、Bで、角度を算出する方法をとる場合は、第1のメモリから点A、Bを指定することが可能であり、輪郭抽出処理を必要としないが、第2のメモリの輪郭データを見て点A、Bの指定を行なう方が特徴が解り易くてよい。また、第3のメモリを表示することにより結果を見ることができ、確認や変更も容易となる。また、回転する際にも、傾き補正プラス回転の組み合わせも容易である。なお、本実施形態の輪郭抽出および輪郭追跡は、どのような手段を用いてもかまわない。

【0031】上記の実施形態によれば、画像データの輪郭抽出とその結果を輪郭追跡することにより、画像データの傾きを検出することができる。画像データの傾きを検出する際に、検出領域を指定して、検出領域内のデータにより傾きを検出し、検出領域の縦横比により水平又は垂直に抽出（回転）することができる。

【0032】画像データの傾きを検出する際に画像データの輪郭抽出を行ない、その結果を表示し、検出領域を指定し、検出領域内のデータにより傾きを検出し、検出領域の縦横比により、水平又は垂直に補正（回転）することができる。

【0033】また、画像データの傾きを検出する際に、画像データの輪郭抽出を行ない、その結果を表示し、傾きの線分を指定し、指定した線分の縦横比により、水平又は垂直に補正（回転）することができる。

【0034】

【発明の効果】以上の説明より明かなように、本発明の画像処理装置は、取得した画像データから画像の輪郭を抽出し、画像の輪郭を追跡し追跡した結果に基づき傾きを検出する。この傾きの検出により、水平又は垂直に補正（回転）、指定領域の画像データに基づく傾きの検出、画像データの輪郭抽出を表示することによる傾き補正の容易化等が可能となる。

【図面の簡単な説明】

【図1】本発明の画像処理装置の実施の形態を示す主要構成ブロック図である。

【図2】図1の画像処理部の構成例を示すブロック図である。

【図3】図2のメモリ部の構成例を示すブロック図である。

【図4】基準軸設定の動作例を示すフローチャートである。

【図5】傾き検出の動作例を示すフローチャートである。

【図6】輪郭抽出の手順を説明するためのマトリックスである。

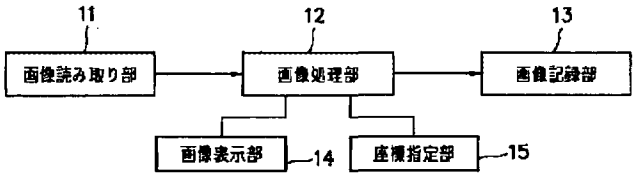
【図7】傾きの検出手順を説明するためのマトリックスである。

【図8】補正の手順を説明するための原稿画像例である。

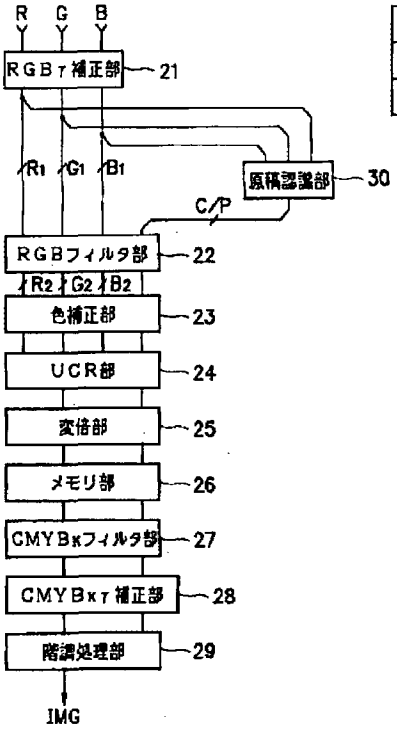
【符号の説明】

11　原稿読み取り部
12　画像処理部
13　画像記録部
14　画像表示部
15　座標指定部
21　RGBγ補正部
22　RGBフィルタ部
23　色補正部
24　VCR部
25　変倍部
26　メモリ部
27　CMYBkフィルタ部
28　CMYBkγ補正部
29　階調処理部
30　原稿認識部
31　第1メモリ
32　第2メモリ
33　第3メモリ

【図1】



【図2】

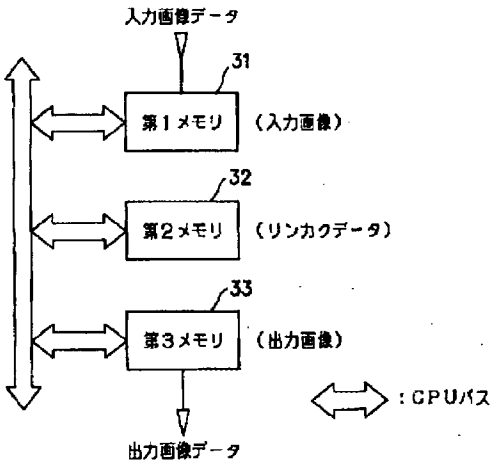


【図6】

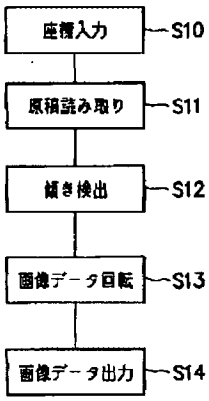
a	b	c
d	e	f
g	h	i

eは中心画素

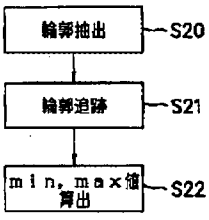
【図3】



【図4】



【図5】

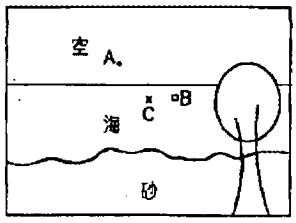


【図7】

8	1	2
7	P	3
6	5	4

Pは中心画素

【図8】



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【補正対象項目名】０００５
【補正方法】変更
【補正内容】
【０００５】本発明は、原稿に対してでなく、原稿内の画像データに対する傾き補正を可能とする画像処理装置を提供することを目的とする。